

WHAT IS CLAIMED IS:

1. A telescoping camera crane comprising:
 - a first section;
 - a counter weight carrier moveably along the first section;
 - 5 a second section linked to the counter weight carrier;
 - a third section extendible from the second section;
 - a camera platform supported by the third section; and
 - an actuator linked to the counter weight carrier.
2. The telescoping camera crane of claim 1 where the actuator
10 comprises a hydraulic cylinder.
3. The telescoping camera crane of claim 2 further including a piston
within the hydraulic cylinder, a first cable connecting to a first side of the piston and
to a first side of the counter weight carrier, and a second cable connecting to a
second side of the piston and to a second side of the counter weight carrier.
- 15 4. The telescoping camera crane of claim 1 with the first section pivotably
mounted on a center post, and further including a camera platform leveling system
linked to the center post and to the camera platform.

5. The telescoping camera crane of claim 1 further including an extension cable running around an extension roller on the second section and having a first end attached to the first section and a second end attached to the third section.

6. The telescoping camera crane of claim 5 further including a retraction
5 cable running around a retraction roller on the second section and having a first end attached to the third section and a second end attached to the first section.

7. The telescoping camera crane of claim 1 with the first, second and third sections comprising hollow tubes, and further including a plurality of rollers supporting the second section within the first section and allowing the second
10 section to extend at least partially into and out of the first section.

8. The telescoping camera crane of claim 7 wherein at least 80% of the length of the second section is extendible out of the first section.

9. The telescoping camera crane of claim 4 wherein the counter weight carrier is moveable along the first section from a forward position, where the counter
15 weight carrier is forward of the center post, to a rear position adjacent to a back end of the first section.

10. The telescoping camera crane of claim 4 with the camera platform leveling system comprising a first leveling cable connecting to the camera platform, and extending around a leveling roller on the second section and connecting to a

leveling axle pivotably supported on the first section, and with a second leveling cable attached to the leveling axle and to the center post.

11. The telescoping camera crane of claim 10 further including a spring in the second leveling cable.

5 12. The telescoping camera crane of claim 2 further including first and second hydraulic lines extending from a valve assembly to first and second ports adjacent to first and second ends of the hydraulic cylinder, an accumulator connecting with the valve, a pump connecting with the accumulator, and a reservoir connecting with the pump, and with a motor linked to the pump for charging the
10 accumulator.

13. The telescoping camera crane of claim 4 wherein the center post is inclined rearwardly at an angle ranging from 5-15 degrees.

14. The telescoping camera crane of claim 7 wherein the rollers comprise a plastic material having a Shore hardness of 70-90.

15 15. The telescoping camera crane of claim 1 wherein the second and third sections have an upward radius of curvature.

16. The telescoping camera crane of claim 15 wherein the upward radius of curvature ranges from 8,000 to 20,000 inches.

17. The telescoping camera crane of claim 7 wherein the second and third tubes are generally square.

18. The telescoping camera crane of claim 1 further comprising a linear transducer adapted for measuring the position of at least one of the second and
5 third sections relative to the first section, and an electronic controller linked to the linear transducer.

19. The telescoping camera crane of claim 7 wherein the extension travel of the second or third section is at least four times greater than the roller spread on the second or third section.

10 20. The telescoping camera crane of claim 1 further comprising an end riser between the third section and the camera platform.

21. The telescoping camera crane of claim 20 wherein the end riser is pivotable into an overslung position, an underslung position, and a 90 degree position.

15 22. A camera crane comprising:

a first tube;

a second tube extendible from the first tube;

a third tube extendible from the second tube;

a counter weight moveable relative to the first tube; and

a hydraulic actuator adapted for directly or indirectly moving the counter weight and at least one of the second tube and the third tube.

23. The camera crane of claim 22 wherein at least one of the second tube
5 and the third tube has a radius of curvature ranging from 8,000-20,000 inches.

24. A camera crane comprising:

a telescopically extendible arm;

a camera platform supported on the arm;

a mechanical leveling system linked to the camera platform, to keep
10 the camera platform in a horizontal position, regardless of the elevation angle of the arm;

a counter weight moveable along the arm; and

a drive system for extending the arm and simultaneously moving the counter weight, to keep the arm in balance.

15 25. A hydraulic actuator, comprising:

a cylinder;

a first port adjacent a first end of the cylinder;

a second port adjacent a second end of the cylinder;

a piston within the cylinder and moveable within the cylinder between the first and second ends;

one or more seal elements sealing the piston against an inside surface
5 of the cylinder;

a first cable section attached to a first side of the piston and extending through a first cable seal at the first end of the cylinder; and

a second cable section attached to a second side of the piston and extending through a second cable seal at the second end of the cylinder.

10 26. The hydraulic actuator of claim 25 wherein the first cable section and the second cable section are joined together forming a continuous cable extending through the piston.

27. A four way hydraulic valve, comprising:

a valve body;

15 a valve base attached to the valve body;

first, second, third and fourth bores extending within the valve body and the valve base;

a first valve pin in the first bore and biased by a first spring into engagement with a first valve seat in the valve body;

a second valve pin in the second bore and biased by a second spring into engagement with a second valve seat in the valve body;

5 a third valve pin in the third bore and biased by a third spring into engagement with a third valve seat in the valve body;

a fourth valve pin in the fourth bore and biased by a fourth spring into engagement with a fourth valve seat in the valve body;

10 a first port in the valve body connecting the first bore and the second bore;

a second port in the valve body connecting the third bore and the fourth bore;

third port in the valve base connecting the first bore and the third bore;

15 fourth port in the valve base connecting the second bore and the fourth bore, and with valve seats positioned between the first and second ports, and the third and fourth ports; and

cam shaft pivotably mounted on the valve body in engagement with the valve pins.

28. A camera crane comprising:

a telescopically extendible arm;

a camera platform supported on the arm;

5 a mechanical leveling system linked to the camera platform, to keep the camera platform in a horizontal position, regardless of the elevation angle of the arm;

a counter weight moveable along the arm; and

a battery powered drive system for extending the arm and
10 simultaneously moving the counter weight, to keep the arm in balance.

29. The camera crane of claim 28 wherein the drive system comprises a hydraulic system powered only by the battery.